

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930—Continued*

SEPTEMBER 28, 1930

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature °C.	$\Delta t$ 100 m.	Humidity		Wind		Remarks
					Relative	Vapor pressure	Direction	Velocity	
P. m.	M.	Mb.	°C.		P. ct.	Mb.		M.p.s.	
4:02	225	980.7	11.2		69	9.18	w.	9.4	10 St. Cu., WSW.
4:03	411	959.1	11.0	0.11	73	9.58	ws.	13.5	
	500	953.6	10.2		76	9.45	ws.	15.7	
	1,000	892.6	5.8		92	8.48			
4:07	1,242	867.0	3.6	0.89	100	7.90			Base of St. Cu.= 867 M. m.s.l.
	1,500	839.3	2.2		99	7.09			
	2,000	788.0	-0.5		98	5.74			
4:15	2,492	742.1	-3.2	0.54	96	4.50			
	2,500	740.8	-3.0		94	4.48			
4:16	2,577	734.2	-1.5	-2.00	79	4.27			
4:18	2,900	705.1	0.0	-0.46	58	3.54			
	3,000	696.0	-0.5		58	3.40			
4:22	3,638	642.7	-3.5	0.47	56	2.56			
4:23	3,808	629.0	-1.8	-1.00	43	2.27			
	4,000	614.5	-2.0		41	2.12			
4:27	4,461	579.4	-2.6	0.12	37	1.82			
4:35	5,000	542.1	-4.1		28	1.22			
	5,752	491.9	-6.2	0.28	15	0.55			
	6,000	477.1	-7.8		15	0.48			
	7,000	418.7	-14.4		13	0.23			
4:42	7,211	406.9	-15.8	0.66	13	0.20			
	8,000	366.5	-20.9		12	0.11			
4:49	8,519	341.2	-24.3	0.65	12	0.08			
	9,000	319.4	-28.6		13	0.06			
4:56	9,716	288.6	-35.1	0.90	14	0.03			
	10,000	277.4	-36.8		14	0.03			
5:01	10,710	249.9	-41.0	0.59	14	0.02			
5:02	10,948	241.3	-40.2	-0.34	14	0.02			
	11,000	239.9	-40.6		14	0.02			
	12,000	206.6	-48.4		12	0.01			
5:08	12,238	199.1	-50.4	0.79	12	(1)			Tropopause.
	13,000	177.3	-52.0		12	(1)			
5:16	13,397	166.6	-52.9	0.22	12	(1)			

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4:00	225	990.5	17.0		33	6.40	w.	5.7	Cloudless.
	500	957.5	14.5		35	5.78	w.	8.2	
	1,000	923.8	10.1		38	4.70	w.	10.4	
4:03	1,241	877.2	7.9	0.90	40	4.26	w.	11.0	
	1,500	850.0	5.7		43	3.94	w.	10.8	
4:05	1,987	800.5	1.7	0.83	48	3.31	wnw.	15.9	
	2,000	799.5	1.8		47	3.27	wnw.	16.2	
4:06	2,169	782.6	3.4	-0.93	30	2.34	wnw.	18.9	
	2,500	751.0	2.3		47	3.39	nw.	29.6	
4:08	2,510	750.4	2.3	0.32	48	3.46	nw.	29.8	
4:09	2,902	714.6	-0.2	0.64	57	3.43	nw.	30.6	Pressure trace ques-
	3,000	705.0	-0.6		57	3.31	nw.	30.6	tionable; alti-
4:11	3,751	642.2	-4.0	0.45	57	2.50	wnw.	28.2	tudes determined
	4,000	622.1	-5.0		53	2.14	wnw.	28.8	from 2-theodolite
4:13	4,353	594.9	-6.4	0.40	48	1.72	wnw.	28.7	observations;
	5,000	547.7	-10.5		40	1.00	wnw.	29.8	pressure com-
4:17	5,790	493.6	-15.5	0.63	30	0.48	wnw.	26.8	puted from alti-
	6,000	480.9	-17.0		30	0.42	wnw.	21.5	tudes and tem-
	7,000	420.4	-24.0		29	0.21	wnw.	23.2	peratures.
	8,000	366.3	-31.1		28	0.10	wnw.	30.2	

1 Less than 0.01 mb.

TABLE 2.—*Tabulated data of sounding-balloon ascents at Royal Center, Ind., during September, 1930—Continued*

SEPTEMBER 28, 1930—Continued

Time 90th mer.	Altitude, M. S. L.	Pressure	Temperature °C.	$\Delta t$ 100 m.	Humidity		Wind		Remarks
					Relative	Vapor pressure	Direction	Velocity	
P. m.	M.	Mb.	°C.		P. ct.	Mb.		M.p.s.	
4:25	8,613	334.7	-35.4	0.70	28	0.06	wnw.	26.8	
	9,000	316.8	-38.5		27	0.04	wnw.	24.7	
	10,000	273.2	-46.5		26	0.02	wnw.	30.7	
4:31	10,503	253.0	-50.5	0.80	25	0.01	wnw.	29.1	
	11,000	234.1	-53.6		25	0.01	w.	26.7	
4:37	11,996	200.4	-59.7	0.62	25	(1)	w.	40.0	Tropopause.
	13,000	171.0	-60.1		25	(1)	w.	31.4	
4:41	13,423	159.6	-60.3	0.04	25	(1)	w.	26.7	
4:42	13,488						w.	26.0	

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4:02	225	992.1	17.0		47	9.11	n.	4.2	Few A. Cu., W.
	500	960.0	14.4		51	8.37	nnw.	6.0	
	1,000	905.2	9.7		60	7.22	nnw.	7.3	
4:06	1,261	876.7	7.2	0.95	64	6.50	nw.	4.3	
4:07	1,476	854.1	7.5	-0.14	64	6.04	nw.	10.9	
	1,500	851.5	7.4		64	6.59	nw.	11.1	
	2,000	800.1	5.5		64	5.78	wnw.	17.0	
4:09	2,143	786.9	4.9	0.39	64	5.54	w.	19.3	
	2,500	755.0	3.2		60	4.61	w.	21.6	
4:11	2,539	750.0	3.0	0.48	60	4.55	w.	21.6	
	3,000	709.7	-0.7		68	3.92	wnw.	23.7	
4:15	3,353	677.5	-3.5	0.80	74	3.39	wnw.	25.1	
4:16	3,769	642.7	-4.9	0.34	50	2.04	wnw.	23.0	
4:17	3,923	630.3	-4.5	-0.26	43	1.81	wnw.	23.0	

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4:04	225	997.6	15.3		50	8.70	n.	5.5	Few Cl., NW.
	500	965.0	13.1		53	7.99	n.	6.6	Cu., NW.
	1,000	909.4	9.1		59	6.82	n.	6.4	Pressure trace ques-
	1,500	856.2	5.1		66	5.79	nnw.	5.1	tionable; alti-
4:09	1,784	826.4	2.8	0.80	69	5.15	nnw.	4.9	tude determined
	2,000	805.0	4.1		54	4.42	nnw.	8.8	from 2-theodolite
4:11	2,230	782.4	5.5	-0.61	39	3.52	nnw.	11.6	observations;
	2,500	757.0	5.3		33	2.94	nnw.	10.6	pressure com-
4:11½	2,547	752.6	5.3	0.06	32	2.85	nnw.	10.4	puted from alti-
4:12	2,628	745.2	5.5	-0.25	30	2.71	nnw.	10.5	tudes and tem-
4:14	3,002	711.7	5.0	0.13	28	2.44	nnw.	18.4	peratures.
	4,000	626.0	-1.3		31	1.70	nw.	18.6	
	5,000	551.1	-7.5		34	1.11	nw.	19.7	
	6,000	486.1	-13.8		37	0.69	nw.	20.2	
4:23	6,337	465.5	-15.9	0.63	38	0.59	nw.	21.4	
	7,000	427.0	-20.5		38	0.38	nw.	20.9	
	8,000	372.5	-27.4		38	0.19	nw.	21.9	
	9,000	323.2	-34.3		38	0.09	nw.	27.6	
4:33	9,531	299.1	-38.0	0.69	38	0.06	nw.	26.7	
	10,000	279.5	-41.4		37	0.04	nw.	25.4	
	11,000	241.6	-48.7		36	0.01	wnw.	28.0	
	12,000	206.6	-56.0		35	0.01	wnw.	32.6	
4:43	12,118	202.4	-56.9	0.73	36	0.01	nw.	32.8	
	13,000						nw.	34.0	
4:48	13,591						nw.	35.0	

1 Less than 0.01 mb.

## RECORD SHORT-PERIOD RAINFALLS IN FLORIDA

GEORGE V. FISH

[Weather Bureau Office, Tampa, Fla.]

The following is a study of record rainfalls for 5, 10, 15, and 30 minutes and for 1, 2, and 24 hours, together with the maximum monthly amounts occurring on or near the coast of Florida, as determined from the data of the first-order Weather Bureau stations in that State.

This subject is important owing to its value to architects, engineers, and all engaged in the aviation industry. They desire to ascertain just what they may expect in the future as inferred from the records of what has happened in the past.

Architects have to consider these values in planning the roofs and foundations of buildings. Engineers consider carefully the amount of run-off they may expect in the season of summer showers. In so far as may be considered justified, they allow a considerable margin for the exceptionally heavy rainfall.

Since an east coast mail pilot was caught in the thunderstorm as reported by James W. Smith (MONTHLY WEATHER

REVIEW, vol. 58, March, 1930, pp. 117-118) every commercial pilot in Florida has had an increased respect for these tremendous downpours of rainfall. The tendency of pilots, previous to that time, was to take off with their ship, try to find a "hole" in the thick weather and get the mail through to their destination. Since that time they have made many flights in weather that was far from good, but only after they had received reports assuring them of frequent breaks in the threatening weather confronting them.

The tables show that by far the greater number of these record amounts occurred in connection with thunderstorms. On the west coast of Florida, from Pensacola to Tampa, practically all the record falls occurred in thunderstorms, though the tabulated amounts for Apalachicola indicate that tropical storms may be a factor in that record. The existing short-period records for Apalachicola are comparatively brief. It is believed that

a much longer record would eliminate tropical storms as the controlling factor, except possibly for the 24-hour and monthly amounts.

It is interesting to note that the greatest monthly catch at Apalachicola, 27.73 inches in September, 1924, is only 0.13 inch less than the maximum for the State, reported by first-order stations, that is, 27.86 inches at Miami in October, 1908. It should be noted that this later amount was recorded before a first-order station was established at Miami.

Both of these extremely heavy monthly rainfalls may be traced to the passage of tropical storms. They are likely to stand for some time as records.

It is thought that but few heavy rainfalls are recorded in Florida during the late fall and winter months. The tables, however, indicate that rains approximating an inch in 30 minutes may occur during practically all the months of the year, at all Florida stations, though it is evident that the short-period amounts are decidedly greatest in the summer and early fall months.

The heaviest rainfall for five minutes, 1.05 inches, occurred at Tampa, in September, 1924, during an afternoon thundershower. The same storm caused a down-pour of 1.66 inches at Tampa in a 10-minute period. Pensacola has the record for the next three periods, 2.27 inches in 15 minutes; 3.63 inches in 30 minutes, and 4.27 inches in 1 hour, all occurring during a thunderstorm in October, 1909. Key West, with a record rainfall of 7.08 inches in two hours stands well ahead of all the other stations for that period. Miami has recorded the greatest amount in 24 hours, 15.10 in November, 1925. It, too, occurred in connection with a thunderstorm.

#### Precipitation, record amounts

##### APALACHICOLA

[R, thunderstorm; DG, disturbance in Gulf; GR, general rain; TD, tropical disturbance; H, hail]

	January	February	March	April	May	June	July	August	September	October	November	December
5 minutes.....	0.36	0.29	0.40	0.53	0.78	0.40	0.42	0.44	0.56	0.65	0.38	0.32
Year.....	1923	1929	1928	1928	1923	1926	1929	1922	1927	1927	1930	1924
10 minutes.....	0.54	0.51	0.61	0.86	1.28	0.63	0.78	0.72	0.88	1.16	0.63	0.50
Year.....	1926	1929	1928	1928	1923	1926	1931	1924	1927	1927	1930	1922
15 minutes.....	0.74	0.66	0.80	1.07	1.65	0.93	1.02	0.96	0.98	1.38	0.76	0.59
Year.....	1926	1929	1925	1928	1923	1926	1931	1922	1930	1927	1930	1922
30 minutes.....	1.06	1.05	1.39	1.72	2.27	1.62	1.45	1.62	1.38	2.10	1.04	0.80
Year.....	1926	1929	1928	1928	1923	1929	1924	1922	1930	1927	1930	1922
1 hour.....	1.20	1.46	2.06	2.64	2.72	2.41	1.62	2.53	1.75	2.73	1.55	1.23
Year.....	1926	1929	1928	1928	1923	1929	1924	1922	1930	1927	1930	1922
2 hours.....	1.74	2.09	2.66	3.75	2.97	2.82	1.65	3.10	2.47	3.09	2.24	1.50
Year.....	1926	1929	1928	1928	1923	1929	1924	1922	1930	1927	1930	1922
24 hours.....	5.15	3.61	5.87	6.32	4.70	5.41	7.14	7.04	10.12	5.65	5.84	6.02
Year.....	1915	1924	1928	1929	1907	1910	1918	1925	1906	1927	1930	1918
Month.....	11.89	10.44	13.97	18.62	9.27	14.90	17.29	14.09	27.73	9.12	8.67	15.88
Year.....	1915	1919	1928	1928	1922	1910	1921	1912	1924	1915	1930	1918

Greatest amounts in 24 hours and for the month for period November 1903, to date. All other amounts for period since July, 1922. No information available as to conditions attending rainfall prior to establishment of first-order station in July, 1922.

#### Precipitation, record amounts—Continued

##### JACKSONVILLE

	January	February	March	April	May	June	July	August	September	October	November	December
5 minutes.....	0.43	0.42	0.53	0.62	0.57	0.67	0.67	0.78	0.62	0.50	0.37	0.56
Year.....	1925	1922	1930	1907	1907	1901	1917	1901	1891	1904	1903	1905
10 minutes.....	0.53	0.70	0.91	0.91	0.94	1.18	1.19	1.20	1.18	0.72	0.55	0.77
Year.....	1925	1922	1905	1907	1919	1901	1917	1907	1891	1904	1896	1905
15 minutes.....	0.82	0.97	1.25	1.09	1.24	1.44	1.65	1.59	1.54	1.06	0.71	0.78
Year.....	1895	1922	1905	1907	1919	1901	1917	1907	1891	1904	1896	1905
30 minutes.....	1.01	1.53	1.63	1.21	1.74	2.07	2.47	2.13	3.12	1.26	0.97	0.97
Year.....	1895	1902	1905	1907	1919	1901	1917	1920	1889	1904	1914	1927
1 hour.....	1.13	1.61	1.89	1.70	2.34	3.13	2.93	2.65	3.12	1.82	1.19	1.27
Year.....	1896	1902	1930	1893	1903	1901	1917	1920	1889	1894	1920	1927
2 hours.....	1.90	1.61	2.23	2.04	3.78	3.21	3.01	2.72	3.14	2.15	1.50	1.60
Year.....	1915	1902	1930	1900	1903	1901	1917	1920	1907	1894	1920	1927
24 hours.....	3.09	4.16	4.47	4.81	9.06	7.66	4.89	6.18	9.86	5.15	3.75	4.97
Year.....	1881	1920	1901	1900	1903	1919	1926	1905	1884	1890	1884	1916
Month.....	9.12	9.16	10.00	8.19	14.80	13.79	14.97	10.97	21.79	16.25	6.09	7.76

##### KEY WEST

	January	February	March	April	May	June	July	August	September	October	November	December
5 minutes.....	0.46	0.39	0.60	0.53	0.64	0.65	0.53	0.57	0.49	0.50	0.46	0.39
Year.....	1924	1925	1911	1904	1925	1899	1912	1926	1918	1912	1911	1912
10 minutes.....	0.81	0.61	0.93	1.02	1.03	0.95	0.73	1.02	0.90	0.95	0.61	0.73
Year.....	1924	1913	1911	1904	1925	1899	1926	1926	1918	1912	1911	1930
15 minutes.....	0.96	0.77	1.19	1.45	1.30	1.25	1.04	1.52	1.06	1.20	0.78	0.95
Year.....	1924	1913	1911	1904	1925	1922	1926	1926	1918	1912	1905	1930
30 minutes.....	1.02	0.96	1.30	1.83	2.24	2.01	1.49	2.68	1.71	1.87	1.09	1.64
Year.....	1924	1913	1911	1904	1925	1922	1926	1926	1920	1909	1906	1930
1 hour.....	1.63	2.29	1.38	1.98	2.78	2.64	2.00	4.30	2.12	3.35	1.71	2.38
Year.....	1899	1902	1905	1904	1929	1900	1916	1926	1920	1909	1906	1930
2 hours.....	1.16	1.30	1.72	2.06	3.45	2.27	2.89	7.06	2.24	5.28	2.95	2.61
Year.....	1915	1913	1905	1919	1929	1912	1916	1926	1920	1909	1906	1930
24 hours.....	3.97	2.99	4.52	3.23	5.83	5.48	7.46	8.32	11.95	11.23	8.86	8.93
Year.....	1879	1902	1905	1882	1904	1900	1916	1926	1919	1909	1906	1879
Month.....	7.65	7.19	6.89	4.99	13.01	12.97	10.89	15.83	17.29	19.77	10.82	10.03

Precipitations 24 hours, 60 years; 5 and 10 minutes and 1 hour, 34 years; 15 and 30 minutes and 2 hours, 27 years.

##### MIAMI

	January	February	March	April	May	June	July	August	September	October	November	December
5 minutes.....	0.29	0.58	0.51	0.55	0.59	0.56	0.64	0.55	0.62	0.49	0.53	0.35
Year.....	1919	1914	1923	1929	1926	1926	1930	1930	1924	1922	1925	1918
10 minutes.....	0.50	0.97	0.96	1.02	0.89	0.98	0.82	0.95	0.98	0.79	0.78	0.66
Year.....	1926	1922	1919	1914	1923	1929	1930	1930	1924	1922	1920	1918
15 minutes.....	0.71	1.19	1.34	1.32	1.29	1.31	1.12	1.06	1.32	1.08	1.09	0.88
Year.....	1926	1922	1919	1914	1913	1929	1930	1927	1924	1924	1925	1918
30 minutes.....	1.13	1.74	2.26	1.83	2.15	1.76	1.82	1.53	1.86	1.83	2.07	1.20
Year.....	1926	1922	1919	1914	1925	1927	1926	1916	1914	1915	1925	1918
1 hour.....	1.76	2.45	2.82	2.05	2.96	2.74	2.68	2.83	2.77	2.69	3.50	1.93
Year.....	1926	1922	1919	1914	1925	1930	1926	1916	1928	1929	1925	1929
2 hours.....	3.07	2.51	3.12	2.63	3.48	3.13	3.01	4.73	4.34	4.66	6.11	3.01
Year.....	1926	1922	1919	1914	1912	1930	1926	1916	1928	1924	1925	1929
24 hours.....	6.69	2.51	9.04	3.22	9.36	7.15	4.90	6.12	10.58	9.53	15.10	5.31
Year.....	1926	1922	1919	1917	1930	1930	1929	1916	1929	1924	1925	1929
Month.....	7.93	5.91	9.74	10.75	18.66	25.34	15.22	13.71	20.35	27.86	17.72	12.06

Number of years of record for excessive precipitation, including greatest in 24 hours, 20. Number of years of record for greatest monthly amounts, 29 for Weather Bureau record; 37 for Weather Bureau and Army records.

## Precipitation, record amounts—Continued

## PENSACOLA

	January	February	March	April	May	June	July	August	September	October	November	December
5 minutes.....	0.51	0.61	0.59	0.64	0.57	0.46	0.53	0.60	0.57	0.78	0.65	0.62
Year.....	1929	1912	1912	1912	1915	1916	1924	1915	1920	1909	1914	1916
10 minutes.....	0.71	0.94	0.97	1.15	1.01	0.79	0.87	1.13	0.99	1.55	1.16	0.92
Year.....	1918	1912	1912	1912	1915	1916	1908	1915	1920	1909	1914	1916
15 minutes.....	0.80	0.96	1.19	1.49	1.31	1.10	1.20	1.27	1.37	2.27	1.64	1.04
Year.....	1918	1912	1912	1912	1915	1916	1906	1915	1920	1909	1914	1916
30 minutes.....	1.07	1.30	1.55	2.10	1.97	1.72	2.17	1.90	2.25	3.63	2.20	1.17
Year.....	1903	1926	1912	1919	1915	1916	1907	1916	1906	1909	1914	1909
1 hour.....	1.64	1.48	3.01	3.10	2.43	2.23	3.33	3.01	3.73	4.27	3.17	1.59
Year.....	1903	1926	1912	1919	1915	1916	1907	1922	1906	1909	1903	1905
2 hours.....	2.58	1.84	3.98	4.38	2.62	2.43	3.96	4.71	6.14	4.82	5.03	2.15
Year.....	1903	1926	1912	1919	1915	1916	1907	1919	1906	1909	1903	1911
24 hours.....	3.52	5.05	8.32	8.91	5.63	10.70	5.01	9.60	8.56	7.30	7.66	4.32
Year.....	1881	1881	1913	1919	1915	1887	1896	1919	1926	1923	1914	1911
1 month.....	9.97	12.53	13.37	13.90	9.92	14.11	17.90	18.52	18.65	14.66	14.82	11.06

\* 2 days after tropical disturbance.

## Precipitation, record amounts—Continued

## TAMPA

	January	February	March	April	May	June	July	August	September	October	November	December
5 minutes.....	0.47	0.66	0.55	0.52	0.70	1.00	0.54	0.59	1.05	0.57	0.44	0.42
Year.....	1904	1927	1900	1928	1930	1900	1920	1906	1924	1928	1903	1907
10 minutes.....	0.65	1.05	1.05	0.79	1.17	1.50	0.87	1.15	1.66	0.90	0.69	0.82
Year.....	1904	1927	1900	1921	1930	1900	1920	1898	1924	1928	1911	1907
15 minutes.....	0.73	1.26	1.40	0.98	1.58	1.90	1.12	1.60	2.03	0.98	0.82	0.94
Year.....	1909	1927	1900	1921	1930	1900	1910	1898	1897	1928	1911	1907
30 minutes.....	0.93	1.96	1.50	1.73	2.00	2.45	1.86	2.72	2.44	1.26	1.31	1.33
Year.....	1912	1927	1900	1920	1930	1900	1920	1925	1924	1902	1923	1907
1 hour.....	1.28	2.17	1.65	2.56	2.74	3.65	2.61	4.01	2.76	1.52	1.55	1.98
Year.....	1904	1927	1900	1920	1902	1930	1920	1925	1924	1923	1925	1907
2 hours.....	1.60	2.40	2.49	2.76	3.04	4.46	2.84	4.59	3.22	2.21	2.04	2.76
Year.....	1904	1927	1930	1920	1902	1930	1920	1925	1907	1923	1925	1907
24 hours.....	3.58	4.06	5.62	2.94	3.55	5.54	6.53	5.04	6.59	4.48	4.18	3.93
Year.....	1914	1902	1930	1923	1930	1909	1925	1915	1897	1921	1916	1907
Month.....	6.73	6.27	9.87	8.04	9.41	13.47	15.63	17.83	18.93	10.33	4.85	7.36

¹ Amount exceeded this year, 1931, -4.25.

## EDWARD H. SMITH ON THE SCIENTIFIC RESULTS OF THE MARION EXPEDITION OF 1928, TO DAVIS STRAIT AND BAFFIN LAND

By W. F. McDONALD

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Since its establishment in 1913 as a result of the *Titanic* disaster, the international ice patrol has been collecting scientific data on the oceanography of the ice regions of the North Atlantic as an adjunct to its primary work of scouting for bergs and warning shipping of dangerous ice movements.

Lieut. Edward H. Smith has for more than 10 years been concerned with the scientific aspects of the ice-patrol work. In his latest monograph on scientific results of the intensive oceanographical survey conducted by the Coast Guard cutter *Marion* during the 1928 patrol season, he sums up not only the fruits of his own extensive observations and researches but also includes a comprehensive survey of world literature on the subject of polar ice and ice movements.

The work, published as Part 3 of Coast Guard Bulletin No. 19, includes original contributions by Lieutenant Smith toward the solution of such complex questions as the following: In what manner does ice from the Polar Basin, Baffin Bay, and Hudson Bay, contribute to supply the North Atlantic? What is the annual variation in ice limits and number of icebergs? In what proportions do wind and current enter to control the drift of icebergs? Is the effect of ice melting in northern waters a factor of importance in the main system of oceanic circulations? What meteorological and other factors govern the probable seasonal prevalence of ice along the trans-Atlantic steamer routes?

The chief source of the icebergs that drift to the steamer lanes is conclusively demonstrated to be the great Greenland glaciers of the Baffin Bay region. Major productivity of bergs is confined to the 300-mile stretch of west Greenland coast, central on the seventieth parallel of latitude, and comprising Northeast and Disko Bays, but a lag of some months and in some cases years intervenes between the calving of bergs and their final disappearance in the waters off Newfoundland. The character of the

weather during the life of a berg has much to do with determining the route over which it drifts, and also its rate of melting.

Lieutenant Smith demonstrates that the quantity and disposition of the great sheets of relatively thin ice, classed as "pack ice" is a most important factor in the number of bergs which reach the vicinity of the steamer lanes. Sheet ice forms annually to an estimated average thickness of six feet over an area believed to be between 400,000 and 500,000 square miles contributory to the northwestern Atlantic. The amount of pack ice formed depends directly upon the severity of the winter temperatures, and perhaps less directly upon other meteorological conditions (such as storminess) which affect the set of the circulations and the mixing of water masses.

Being sheetlike in structure, pack ice responds readily in its movement to wind; in this respect it is perhaps the most responsive of all oceanographic phenomena to meteorological conditions.

Icebergs are not so responsive to wind, because the exposed portion is only a small fraction of the total mass. However, the shape of the berg appears to be quite important in this connection since its manner of drift seems to depend on the ratio of extreme height above water to the maximum depth of immersion rather than upon the relative masses above and below the water line.

The average ratio of height above water to draft in the case of the usual type of Greenland bergs is reported to be much less than commonly supposed. The ratio of 1 to 3 is common in the earlier stages and as low as 1 to 1 has been measured in certain horned or winged disintegration forms.

It is apparent from these and other analogous facts that in general the drift of icebergs is more subject to the influence of sea currents at some depth than to the pressure of wind. Smith adduces quantitative data in respect to the relative importance of wind and current